Space Weather Forecast

Issued on Saturday, 02 September 2023 at 13:27 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: G1-G2 Moderate storms expected 02-03 Sep due to fast winds and Coronal Mass Ejection arrivals, with the potential for further activity 04-05 Sep. Chance of Moderate flares (R1-R2 Radio Blackout) 02 Sep, decreasing 03 Sep onward.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Moderate with a further long duration Moderate flare from the largest and most complex region on the disc. This is approaching the northwest limb, so is becoming increasingly hard to assess. Of the other sunspots there is one in the southeast which has some limited complexity, and a further small bipolar region in the southwest. There are two further small unipolar spots, while a small region has recently emerged and been numbered in the northwest, to give six sunspots in total.

The Moderate flare on the 01 Sep produced a moderately fast Coronal Mass Ejection, but with the bulk of the material mainly directed north and ahead of Earth. However, arrival is anticipated around 03/0600 UTC. A further CME was also observed due to a small eruption from the sunspot on the southwest disc at 01/0620 UTC. This has been analysed as a slower and weaker CME, largely passing ahead and south of Earth, but with a chance of a glancing impact 03 Sep. Further CMEs have been observed, with a CME associated with the recent Moderate flare from the region on the northwest limb awaiting analysis.

Solar Wind / Geomagnetic Activity: Ongoing fast wind influence was observed, with a likely transition into the main core of fast winds from a coronal hole occurring. Solar wind speeds were initially 400-450 km/s, but fairly rapidly increased 01/1750-1830 UTC to become 500-600km/s. A further increase to approximately 700km/s was recorded from around 02/0400 UTC, declining slightly by the end of the period with observations becoming more unreliable. The total Interplanetary Magnetic Field (IMF), Bt, persisted Weak to Moderate around 5-11nT, with the north-south direction, Bz, remaining variable between +9 nT and -10nT. Geomagnetic activity was Quiet to Active (Kp 1-4, with the Kp4 interval 01/1200-1500 UTC) initially, but became Active from 02/0000 UTC, with a G1 minor storm (Kp 5) interval recorded 02/0600-0900 UTC.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) was at S1 Minor Radiation Storm levels between 01/1200 UTC and around 01/2000 UTC. Values subsequently eased below the S1 level, but remain above background levels.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate activity day 1 (02 Sep), with a further risk of Moderate flares from the northwest sunspot. This activity is expected to ease day 2 (03 Sep) onward, as this rotates over the northwest horizon, with the other spots on the disc currently smaller and simpler.

Solar Wind / Geomagnetic Activity: There are two main CMEs, and a further small glance

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possible in the forecast. The first is expected to arrive 02/2200 UTC +/- 9hours and is from 30 Sep. The second is expected to arrive 03/0600 +/- 9hours, and is from the moderately fast CME which occurred alongside the Moderate flare on 01 Sep. A further small glance is possible on day 3 (3 Sep) from the further small CME which left the Sun 0600 on 01 Sep.

Generally Active conditions with G1 Minor Storm intervals are expected at first due to the ongoing fast wind stream and potential CME arrivals. The first arrival is expected to bring a chance of G2 Moderate storms from late day 1 (02 Sep), before the second CME arrives early day 2 (03 Sep), with isolated G1-G2 Minor to Moderate storms expected, and a slight chance of G3 Strong Storms. This activity is likely to ease day 3 (04 Sep), however potential ongoing CME and fast wind effects may bring further G1 Minor Storms with a slight chance of G2 Moderate storms. Activity then easing further day 4, to mainly Unsettled, but with a chance of Active to G1 Minor storm intervals given the potential for further enhancement and continued fast winds.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is expected to slowly decline towards background levels, however further Minor Storms are possible, mostly in the next two days.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	80	80	60	30
Strong	G3	No	10	20	10	5
Severe	G4	No	1	5	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	50	40	30	20
Very Active	R3 to R5 X	No	5	2	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	Yes	15	10	5	2
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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